

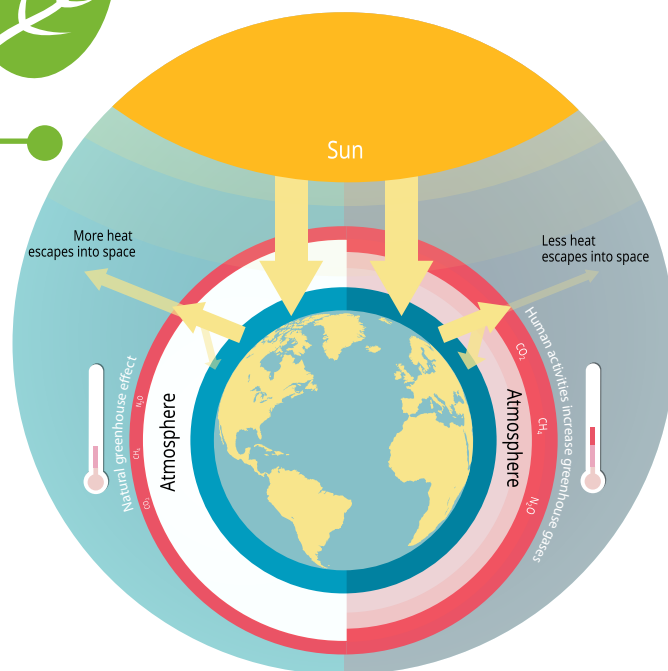
## AGRICULTURE & GREENHOUSE GASES

### The Greenhouse Effect

**Greenhouse gases** (GHGs) absorb radiation from the sun and trap heat in the atmosphere, which can lead to warming of the Earth's surface.

GHGs include **carbon dioxide** (CO<sub>2</sub>), **methane** (CH<sub>4</sub>), **nitrous oxide** (N<sub>2</sub>O) and **fluorinated gases** or **halocarbons**. Most GHGs are released in nature and are also produced by human activities connected with oil and gas, transportation, buildings, electricity, heavy industry, agriculture, waste and others.<sup>1</sup> The exception is halocarbons, which are human-made.

Since human sources of GHGs add emissions to the atmosphere at a rate greater than natural processes can remove them, atmospheric levels of GHGs are building up. In Canada GHG emissions increased from 600 metric tonnes of CO<sub>2</sub> equivalent (Mt CO<sub>2</sub> eq) in 1990 to 716 Mt CO<sub>2</sub> eq in 2017.<sup>2</sup>



### HOW DOES GROWING FOOD CREATE GHGS?

GHGs released from growing crops include N<sub>2</sub>O and CO<sub>2</sub>. CO<sub>2</sub> is produced by farm equipment, working soil (**cultivation**), as well as naturally through plant growth and decay. N<sub>2</sub>O emissions are primarily a result of fertilizer use, including manure.

Methane (CH<sub>4</sub>) from agricultural activities also contributes to GHGs, mainly as a natural by-product from feed digestion in the stomachs of cattle, as well as manure from farm animals.<sup>3</sup>



Methane



Farm Equipment



Cultivation



Plant Growth



Plant Decay

### HOW DOES AGRICULTURE STACK UP?

Canadian agricultural emissions have stayed about the same for the last 20 years.<sup>4</sup> However, food production has increased dramatically because farms have become more efficient – and farmers are able to produce more food using less land, water and fuel.<sup>5</sup>

Canada's total GHG emissions are  
1.6% of global emissions.<sup>6</sup> Of that,  
agriculture contributes 8.4%.<sup>7</sup>



Conservation tillage reduces erosion and increases carbon sequestration.

## AGRICULTURE & GREENHOUSE GASES

### AGRICULTURE IS TAKING A LEADING ROLE

Plants release oxygen ( $O_2$ ) and remove  $CO_2$  from the atmosphere during photosynthesis. If managed appropriately agricultural ecosystems are able to capture and store carbon in soil organic matter. This is called **carbon sequestration**. Not only does this help reduce atmospheric  $CO_2$ , it also improves soil nutrients and fertility to grow food.

Farmers improve carbon sequestration by either increasing the capture and storage of carbon or reducing the loss of stored carbon. Canadian agricultural soils, particularly in the prairie provinces, are now a significant carbon sink – they capture more carbon than is released.<sup>8</sup>



**PEAS CAPTURE NITROGEN AND CARBON DIOXIDE FROM THE AIR AND STORE IT IN SOIL.**



### IMPROVING HOW WE RAISE FARM ANIMALS

Canada is one of the lowest GHG emitters per unit of animal protein produced in the world, accounting for about 4% of the country's total GHG emissions.<sup>9</sup>

Producing 1kg of beef in Latin America, India or China generates twice the methane as in North America, Europe or Australia.<sup>10</sup>

Much of this is as a result of research and investment in animal science.

#### Advancements include:

- **Increasing productivity** includes improving reproduction rates, lower mortality rates, improved animal welfare and animal health.
- **Growth hormones** assist natural hormones in beef cattle by promoting growth of muscle rather than fat so that animals grow more quickly, make more efficient use of feed and produce leaner meat.
- **Giving animals better quality feed** improves growth and the ability to digest and use the feed with less waste. This also means fewer GHG emissions and less manure.
- **Improved manure management practices** reduce the release of methane and nitrous oxide and control the release of nutrients and microbes into the broader environment.
- **Selecting animals with more feed efficient genetics** contributes to better conversion of feed into animal products, requiring less animal feed and other resources to grow the same amount of meat.

### IMPROVING HOW WE GROW CROPS

Agricultural cropping practices can increase carbon in the soil, enhance soil biodiversity and restore ecosystems to encourage the buildup of organic soil carbon.

Examples include:



Farmers use GPS and other technology to reduce inputs.

- **Conservation tillage** – seeding directly into unworked land rather than working (**tilling**) soil to prevent washing or blowing away of soil (**soil erosion**)
- **Precision agriculture** – precise placement of seed, fertilizer and other crop management products to reduce usage
- **Increasing the number of crop in a rotation** – growing different crops from year to year in a sequence to manage soil nutrients and prevent depletion
- **Avoiding the cultivation of marginal lands**, such as grasslands (or converting marginal crop lands back to grass) that are unsuitable